REMARKS

Summary of Office Action

Claims 1-8, 12, 13 and 16-19 were pending in this application.

Claims 1, 12, and 13 were rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro et al. JP 2004-010409 ("Masahiro"). Claims 2-5, 8 and 16 were rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro and further in view of Hase et al. U.S. Patent No. 5,839,718 ("Hase"), Kanerari et al. U.S. Patent No. 6,431,236 ("Kanerari"), Murazaki et al. U.S. Patent No. 6,617,781 ("Murazaki") and Yocom et al. U.S. Patent No. 6,071,432 ("Yocom"). Claims 6 and 7 were rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro in view of Murayama et al. U.S. Patent No. 5,424,006 ("Murayama").

Claims 1, 6-8, 12, 13 and 16-19 were rejected under 35 U.S.C. § 103(a) as being obvious from Availvs Corp. WO 03/057796 (using Saito et al. U.S. Patent No. 7,074,345 ("Saito") as the English language translation) in view of Odlum U.S. Patent No. 6,197,712 ("Odlum") and Masahiro. Claims 2-5 and 16 were rejected under 35 U.S.C. § 103(a) as being obvious from Saito in view of Odlum and further in view of Hase, Kanerari, Murazaki, and Yocom.

Summary of Applicants' Reply

Applicants have amended claims 1-4, 12, 13, 16, 18 and 19 in order to more particularly define the claimed invention. Applicants have canceled claims 5-8 and 17 without prejudice. No new matter has been added and the amendments are fully supported by the originally filed specification. (See, e.g., applicants' specification at

p. 12, Example 3 to p. 14, Example 5 and ¶¶ 14, 46 and 57.)

The Examiner's rejections are respectfully traversed.

Reply to the Rejections Under
35 U.S.C § 103(a)

Claims 1, 2-4, 12, 13 and 16

Claims 1, 12, and 13 were rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro. Claims 2-4 and 16 were rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro in view of Hase, Kanerari, Murazaki, Yocom, or Murayama ("secondary references").

Applicants' claim 1, as amended, is directed to an article of light-storage self-luminescent glass that includes (a) 0.01-40% by weight of a light-storage self-luminescent material activated by multiple ions and (b) 99.99-60% by weight of a matrix glass. During a forming process of the article, the matrix glass is melted and the self-luminescent material is doped into the melted matrix glass. The article of glass is either a hollow glass article, a laminated glass article or a stripped-luminescent glass article. The color of the article of glass is either red, orange-red, yellow-green, blue-green blue or purple. The light-storage self-luminescent material has a particle size from 10 microns to 20 millimeters. Applicants have attached herewith as Exhibit A an exemplary glass article having exemplary red color properties of the claimed invention.

Masahiro describes a process for producing a glass article which consists of molten glass and a powdery luminous stone. The size of the powdery luminous stone ranges from 0.1-1.0 mesh (Masahiro, Abstract and paragraphs 7, 12 and 14).

The Examiner acknowledges that Masahiro does not teach the claimed amount of luminescent material but stated it would have been obvious to modify the reference to arrive at applicants' claimed invention.

Applicants respectfully submit that Masahiro does not show or suggest an article of self-luminescent glass that includes one of the following colors: red, orange-red, yellow-green, blue-green, blue or purple color, as defined by applicants' claim 1. Masahiro shows a green colored glass article but Masahiro's teachings cannot be used to make a red or orange-red glass article.

There are a number of obstacles to overcome to create an article having applicants' claimed properties and in particular the claimed color properties. First, attempts have been made to create red (or orange-red) tones in light-storage articles using sulfide materials. However those materials begin to break down as activator ions in the sulfides become oxidized from lower valence to higher valence when heat is applied to the sulfides. Thus, the resistance to high temperature of sulfide materials is lowered which prevents their effective use in forming glass articles. Applicants' claimed invention overcomes this deficiency by preventing the exposure of the sulfides to high oxidizing atmospheres (e.g., by placing the sulfides in melted glass which prevents the exposure of the sulfides to a direct flame or by limiting the amount of oxygen in the space where the sulfides are placed) and thereby preserving their self-luminescent properties. Additionally, applicants' claimed invention enables the use of aluminate and silicate materials which are more stable under high temperature conditions.

Second, the expansion coefficients between the self-luminescent material and the matrix glass must be considered to avoid destroying the glass during the formation process. In particular, the glass may have a different expansion coefficient than the self-luminescent material and when both are heated the glass may expand at an undesired rate and may be destroyed. Applicants' claimed invention overcomes this deficiency by doping the matrix glass with the self-luminescent material after the glass has been melted. This enables the use of a wider variety of matrix glasses having different expansion coefficients which enriches the combinations of different self-luminescent materials with different matrix glasses.

Given at least the above mentioned obstacles, the modifications to Masahiro necessary to arrive at applicants' claimed invention would not be obvious to one of ordinary skill in the art with expectation of success. In particular, it would not be obvious to one of ordinary skill in the art to use sulfide materials with the method of Masahiro to create an article of glass having applicants' claimed properties (including the colors of the glass) because the person of ordinary skill in the art would recognize that such materials would destroy the Masahiro glass article.

Applicants' claimed invention prevents the breakdown of the materials by preventing the exposure of the materials to high oxidizing atmospheres. Additionally applicants' claimed invention prevents the destruction of the glass during the formation process caused by the differences in expansion coefficients by melting the matrix glass prior to the application of the self-luminescent material.

Moreover, applicants respectfully submit that Masahiro does not show or suggest that during the forming process of the article of glass, the matrix glass is melted and the self-luminescent material is *doped into the melted matrix glass*, as defined by applicants' claim 1 (emphasis added). In particular, applicants' claimed forming process involves doping the self-luminescent material into the glass while the temperature of the glass is decreasing (and not exposing the material to a direct flame). In contrast to applicants' claimed invention, the method of Masahiro requires that one glass stick *with the light emitting material has to be melted* (under a flame) with another to form the glass article. Clearly, the light emitting material is combined with the glass while the glass it heated and melted which is different from doping the material into already melted glass. The result of this exposes the light emitting material to a high oxidizing atmosphere with high temperature and adversely affects the self-luminescent properties of the material. Thus, even if one of ordinary skill in the art could modify Masahiro to arrive at applicants' glass article including the claimed colors, the resulting product would have luminescence properties (such as brightness and afterglow) that are inferior to applicants claimed glass article because of the self-luminescent material's exposure to the oxidizing atmosphere.

Finally, nowhere does Masahiro show or suggest an article of self-luminescent glass that is hollow, laminated or stripped-luminescent, as required by applicants' claim 1. In particular, as defined by applicants' claim 13 (with respect to the process for producing the hollow glass article), the melted glass is blown into a parison bubble

using a blowing iron and self-luminescent material is added into the bubble from a mouth of the blowing iron such that the material is uniformly attached to the inner wall of the hollow glass article (see, e.g., Exhibits B and C). This process restricts ambient air from entering into the parison bubble and exposing the self-luminescent material. More specifically, the space formed by the parison bubble and the blowing iron is a closed atmosphere. Moreover, as the gases in the parison bubble expand due to the high temperature, the concentration of the oxygen gas is decreased and thereby the oxidizing effect of the atmosphere inside the parison bubble is lowered.

Applicants continue to take issue with the Examiner's interpretation of the mesh values discussed in Masahiro. In particular, applicants disagree with the Examiner that 0.1 mesh corresponds with a pore size of 0.1 inch, as previously discussed. At best, one must conclude that there is no unified standard for mesh values. Therefore, the indication of 0.1 mesh in Masahiro itself is not a definite expression. Nevertheless, applicants believe that one skilled in the art could conclude that the particle size represented by 0.1 mesh is *larger* than that represented by 1 mesh. Therefore, the lower limit of the particle size disclosed in Masahiro is 25.4 millimeters (or 1 mesh), which is already larger than the upper limit of 20 millimeters of the claimed invention. Accordingly, it is impossible for Masahiro to show or suggest applicants' claimed range of 10 μm to 20 mm as the ranges in Masahiro begin above 20 mm.

None of the secondary references, cited by the Examiner as showing additional limitations of the claims,

make up for the deficiencies of Masahiro relative to the rejection.

Accordingly, applicants' independent claim 1, and claims 2-4, 12, 13 and 16 which depend, directly or indirectly, from claim 1, are patentable over Masahiro.

Claims 1, 2-4, 12, 13 and 16, 18 and 19

Claims 1, 2-4, 12, 13 and 16, 18 and 19 were rejected under 35 U.S.C. § 103(a) as being obvious from Saito in view of Odlum and Masahiro. Claims 2-4 and 16 were rejected under 35 U.S.C. § 103(a) as being obvious from Saito and Odlum, further in view of Hase, Kanerari, Murazaki and Yocom.

Saito, generally speaking, discusses the formation of a photoluminescent material by blending a transparent base material such as a resin and a photoluminescent pigment component (Saito, col. 2, line 60 to col. 3, line 3).

Odlum describes a method to produce phosphorescent glass artifacts by mixing soda-lime-silica glass with a phosphor particle (Odlum, col. 2, lines 9-17).

The Examiner acknowledges that Saito does not show or suggest the composition or the glass processing conduction of applicants' claim 1 and cites Odlum and Masahiro as allegedly making up for these deficiencies of Saito. Applicants respectfully disagree.

Applicants' invention, as defined by amended claim 1, is directed to, among other things, an article of light-storage self-luminescent glass that is either hollow, laminated, or stripped-luminescent. Applicants respectfully submit that neither Saito nor Odlum, whether taken alone or in combination, shows or suggests glass articles that are hollow, laminated or stripped-

luminescent, as defined by applicants' claim 1.

Additionally, for at least these reasons and those stated above (with respect to claim 1) Masahiro does not make up for the deficiencies of Saito and Odlum relative to the rejection. In particular, the Masahiro glass articles have properties that are inferior to applicants claimed glass article because of the self-luminescent material's exposure to the oxidizing atmosphere. Applicants' claimed invention is superior to the Masahiro article in that, as defined by applicants' claim 18 (with respect to the process for producing the laminated glass article), the self-luminescent material is spread onto the top surface of the melted glass and then covered with an additional layer of melted glass (see, e.g., Exhibits D and E). This process causes most of the self-luminescent material to be sealed in between the two layers of melted glass which prevents directly exposing the material to high temperature. Most of the volume of the sealed space is occupied by the self-luminescent material and thus the oxygen exposure is reduced. Thus, the exposure of the self-luminescent material to the oxidizing effect of the atmosphere is significantly lower than that of the prior art and in particular that of Masahiro.

Finally, as defined by applicants' claim 19 (with respect to the process for producing the stripped-luminescent glass article), the self-luminescent material is sealed inside a glass tube before being contacted with the melted glass (see, e.g., Exhibits F and G). For similar reasons as above (with respect to claim 18), the exposure of the self-luminescent material to the oxidizing effect of the atmosphere is significantly lowered which provides a glass article with superior properties than

Masahiro.

Hase, Kanerari, Murazaki, and Yocom, cited by the Examiner as showing additional limitations of the claims, also do not make up for the deficiencies of Saito, Odlum, and Masahiro relative to the rejection.

Accordingly, applicants' independent claim 1 and claims 2-4, 12, 13 and 16, 18 and 19 which depend, directly or indirectly, from claim 1, are patentable.

Conclusion

For the reasons set forth above, applicants respectfully submit that this application, as amended, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

Respectfully submitted,

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